

## **REMARKS**

### **Amendments to the Claims**

Claim 1 has been amended to explicitly state that the amount of water-soluble polyurethane present in the ink composition is *fully dissolved*. The water-solubility limit of the polyurethane has also explicitly been defined as greater than about 0.1% at 25 °C (see page 4, lines 14-16 of the specification for support). These amendments are being made solely to expedite prosecution of this case towards allowance and are in no way to be treated as an acquiescence to the Examiner's rejection. It will be appreciated that since the amount of polyurethane present in the ink composition ranges from 0.1 to 5% by weight, the water-solubility limit of the polyurethane in question will also need to correspondingly range from 0.1 to 5% (or more) in order to ensure full dissolution (this is implicitly captured by specifying that the water-soluble polyurethane is *fully dissolved*).

New claim 21 captures polyurethanes with water-solubility limits that are greater than 10% at 25 °C (see page 4, lines 14-16 of the specification for support).

New claim 22 captures polyurethanes with a weight average molecular weight in the range of about 4,000 to 10,000 Da (see page 4, lines 18-23 of the specification for support).

New claim 23 captures polyurethanes with a weight average molecular weight in the range of about 4,000 to 7,000 Da (see page 4, lines 18-23 of the specification for support).

New claim 24 captures polyurethanes with an acid number in the range of about 40 to 60 (see page 4, lines 18-23 of the specification for support).

### **Rejection under 102(e) based on Valentini et al. (US 2005/0020730)**

The rejection of claims 1-3, 5-10, 13-14 and 17-20 under 35 U.S.C. § 102(e) as being anticipated by Valentini et al. (US 2005/0020730, hereinafter "Valentini '730") taken in view of Valentini et al. (US 2003/0184629, hereinafter "Valentini '629") and Ma et al. (US 5085698, hereinafter "Ma") is hereby traversed, reconsideration is respectfully requested.

As noted in the previous response, the claimed invention relates to ink compositions that include *water-soluble* polyurethanes while Valentini '730 teaches ink compositions that include

*water-insoluble polyurethane dispersions* (e.g., see [0053]: “These are polymers that are in a heterogeneous *dispersed* phase *rather than dissolved* in the vehicle [...]”; see also [0054]: “Particularly preferred are polyurethane *dispersion* binders as those disclosed in [Valentini ‘629]”). Applicant further pointed the Examiner to [0090]-[0092] of Valentini ‘730 that describe the preparation of two exemplary polyurethane *dispersion* binders (PUD1 and PUD2) and provides median *particle* diameters for the dispersions – a clear indication that the polyurethane polymers present in the ink compositions of Valentini ‘730 are *water-insoluble*, not *water-soluble* as claimed.

In response, the Examiner has argued that Valentini ‘730 teaches a different invention, namely one in which polyurethanes with acid numbers in the range of 10-100 are added to an ink composition.<sup>1</sup> The Examiner then argued that because this acid number range overlaps with the 30-70 range that is disclosed and claimed in this application, it is “the examiner’s position that the polyurethane of Valentini ‘730 does have *some degree* of water-solubility” (*emphasis added*). The Examiner has then gone on to state that “[w]hile the polyurethane is *not completely water-soluble*, it is noted that there is no requirement in the present claims that the polyurethane is completely water-soluble or dissolves in water” (*emphasis added*).

Applicant disagrees with the Examiner’s reasoning for several reasons.

First, the teachings of these references must be considered *as a whole* including portions that would lead away from the claimed invention. *W. L. Gore & Associates, Inc. v. Garlock, Inc.*, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). Thus, it is important to recognize that the acid number range of 10-100 is provided in the context of teachings that specifically and consistently refer to water-insoluble polyurethane *dispersions*. Those reading Valentini ‘730 (and Valentini ‘629) are therefore being taught to select polyurethanes with acid numbers in the range of 10-100 that are *also* capable of forming *water-insoluble polyurethane dispersions*. In this context, Applicant notes that the acid number range of 10-100 is taught alongside a preferred molecular weight of more than 30,000 Da (see [0073] of Valentini ‘629). While higher acid numbers make polyurethanes more water-soluble, higher molecular weights have the opposite effect. The Examiner’s argument improperly focuses solely on the acid

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<sup>1</sup> Applicant notes as an aside that the generic acid number range of 10-100 is not found in Valentini ‘730 but is indirectly provided by Valentini ‘629.

number of the polyurethanes of Valentini '730 while ignoring that they have molecular weights of more than 30,000 Da (in sharp contrast to the polyurethanes of the present application that have preferred molecular weights of 4,000 to 7,000 Da, e.g., see new claim 23). With this in mind, Applicant respectfully submits that the skilled person is taught by the *entirety* of Valentini '730 (and Valentini '629) to select a combination of molecular weight and acid number that produces a polyurethane that forms *insoluble dispersions*. This might involve a polyurethane with an acid number towards the upper end of the 10-100 range and a molecular weight that is far greater than the lower limit of 30,000 Da.

Second, even if one were to assume that the polyurethanes of the invention are species of those disclosed by Valentini '730 (which Applicant disputes for the reasons above), the Examiner is reminded that a generic teaching (e.g., polyurethanes having the acid number range and molecular weight range of Valentini '730) can only anticipate a species if one of ordinary skill in the art is able to "at once envisage" the relevant species within the genus. MPEP §§ 2131.02-2131.03. In this context, it is appropriate to look to the preferred embodiments to determine which species can be anticipated. *In re Petering*, 133 USPQ 275 (CCPA 1962). Here, Applicant notes that the polyurethanes that are exemplified in Valentini '730 have acid numbers of 25 (see [0090]-[0095]) while those of Valentini '629 range from 20.3 to 31.55 (see Table on page 10). In addition, as previously noted, particle sizes are provided in both references for the *dispersions* that these polyurethanes produce. These preferred embodiments show no overlap with the claimed polyurethanes. In fact, they *teach away* from the claimed invention by teaching the use of water-insoluble polyurethane dispersions. Applicant submits that, after reading Valentini '730, one of ordinary skill in the art would not "at once envisage" the claimed water-soluble polyurethanes as required to anticipate the claims.

Despite disagreeing with the Examiner's rejection for the reasons outlined above, Applicant has amended claim 1 (and claims 2-3, 5-10, 13-14 and 17-20 that include all of the limitations of claim 1) to explicitly state that the amount of water-soluble polyurethane present in the ink composition is *fully dissolved*. The water-solubility limit of the polyurethane has also explicitly been defined as greater than about 0.1% at 25 °C (see page 4, lines 14-16 of the specification for support). These amendments are being made solely to expedite prosecution of this case towards allowance and are in no way to be treated as an acquiescence to the Examiner's rejection. It will be appreciated that since the amount of polyurethane present in the ink

composition ranges from 0.1 to 5% by weight, the water-solubility limit of the polyurethane in question will also need to correspondingly range from 0.1 to 5% (or more) in order to ensure full dissolution (this is implicitly captured by specifying that the water-soluble polyurethane is *fully dissolved*). Dependent claim 3 already covers polyurethanes with water-solubility limits that are greater than 5% at 25 °C. New claim 21 captures polyurethanes with water-solubility limits that are greater than 10% at 25 °C (see page 4, lines 14-16 of the specification for support).

As conceded by the Examiner, the polyurethanes of Valentini '730 are most certainly not completely water-soluble and Valentini '730 does not therefore teach every element of amended claim 1. Valentini '730 cannot therefore anticipate amended claims 1-3, 5-10, 13-14 and 17-20. MPEP § 2131. Withdrawal of this rejection is earnestly requested.

**Rejection under 103(a) based on Valentini et al. (US 2005/0020730) in view of Iu et al. (US 6102998)**

The rejection of claims 11-12 under 35 U.S.C. § 103(a) as being unpatentable over Valentini '730 in view of Iu et al. (US 6102994, hereinafter "Iu") is hereby traversed, reconsideration is respectfully requested.

As discussed above, Valentini '730 does not teach every element of claim 1 (and thus of dependent claims 11-12). Iu is cited as a secondary reference that teaches a co-solvent found in dependent claims 11-12. The Examiner does not point to any teaching in Iu that could provide the claim elements that are missing from Valentini '730. Accordingly, since the combination of Iu and Valentini '730 does not teach every element of the rejected claim it cannot render it unpatentable. MPEP § 2143.03. Withdrawal of this rejection is earnestly requested.

**Rejection under 103(a) based on Valentini et al. (US 2005/0020730) in view of Elwakil et al. (US 5833743)**

The rejection of claims 15-16 under 35 U.S.C. § 103(a) as being unpatentable over Valentini '730 in view of Elwakil et al. (US 5833743, hereinafter "Elwakil") is hereby traversed, reconsideration is respectfully requested.

As discussed above, Valentini '730 does not teach every element of claim 1 (and thus of dependent claims 15-16). Elwakil is cited as a secondary reference that teaches a pH range

found in dependent claims 15-16. The Examiner does not point to any teaching in Elwakil that could provide the claim elements that are missing from Valentini '730. Accordingly, since the combination of Elwakil and Valentini '730 does not teach every element of the rejected claim it cannot render it unpatentable. MPEP § 2143.03. Withdrawal of this rejection is earnestly requested.

**Rejection under 103(a) based on Nichols et al. (US H2113 H)**

The rejection of claims 1-10, 13-16 and 18-20 under 35 U.S.C. § 103(a) as being unpatentable over Nichols et al. (US H2113 H, hereinafter "Nichols") is hereby traversed, reconsideration is respectfully requested.

This obviousness rejection is very similar to the Examiner's novelty rejection based on Valentini '730 that was discussed above. As noted in the previous response, Nichols teaches ink compositions that include an amount of a polyurethane *resin emulsion* (see Abstract; see also column 1, lines 66 to column 2, lines 4 "Particularly useful as the latex resin are known waterborne polyurethane *dispersions*, which resins or polymers [...] can be prepared by polymerizing a polyurethane in a solvent followed by *dispersing* the mixture in water," *emphasis added*). Applicant has also previously pointed the Examiner to column 4, lines 9-13; column 7, lines 1-8; and column 17, lines 6-12 of Nichols that describe processes for preparing polyurethane *resin emulsions* and provide *particle* diameters for the emulsions – a clear indication that the polyurethane polymers present in the ink compositions of Nichols are *water-insoluble*, not *water-soluble* as claimed.

In response, the Examiner has focused on the fact that Nichols teaches polyurethanes with a generic acid number range of 5-70, preferably 10-40 (see column 4, lines 26-27). The Examiner then argued that because this acid number range overlaps with the 30-70 range that is disclosed and claimed in this application, it is "the examiner's position that the polyurethane of Nichols [...] does have *some degree* of water-solubility" (*emphasis added*). The Examiner has then gone on to state that "[w]hile the polyurethane is *not completely water-soluble*, it is noted that there is no requirement in the present claims that the polyurethane is completely water-soluble or dissolves in water" (*emphasis added*). This is exactly the same argument that the Examiner made for Valentini '730 and it therefore suffers from the same deficiencies that were discussed above.

Since the amendment that was made to claim 1 renders the rejection moot, Applicant will not reiterate those arguments. Indeed, the Examiner has properly conceded that the polyurethanes of Nichols are not completely water-soluble and Nichols does not therefore teach every element of amended claim 1. Nichols cannot therefore anticipate amended claims 1-10, 13-16 and 18-20. MPEP § 2131. Withdrawal of this rejection is earnestly requested.

**Rejection under 103(a) based on Nichols et al. (US H2113 H) in view of Iu et al. (US 6102998)**

The rejection of claims 11-12 under 35 U.S.C. § 103(a) as being unpatentable over Nichols in view of Iu is hereby traversed, reconsideration is respectfully requested.

As discussed above, Nichols does not teach every element of claim 1 (and thus of dependent claims 11-12). Iu is cited as a secondary reference that teaches a co-solvent found in dependent claims 11-12. The Examiner does not point to any teaching in Iu that could provide the claim elements that are missing from Nichols. Accordingly, since the combination of Iu and Nichols does not teach every element of the rejected claim it cannot render it unpatentable. MPEP § 2143.03. Withdrawal of this rejection is earnestly requested.

**Rejection under 103(a) based on Hirasa et al. (US 2002/0019458) in view of Hayashi (US 6500248)**

The rejection of claims 1-10 and 17-20 under 35 U.S.C. § 103(a) as being unpatentable over Hirasa et al. (US 2002/0019458, hereinafter “Hirasa”) in view of Hayashi (US 6500248, hereinafter “Hayashi”) is hereby traversed, reconsideration is respectfully requested.

The Examiner argues that Hirasa teaches all of the elements of claims 1-10 and 17-20 *except for* the inclusion of about 0.1 to 15% by weight of a 1,2-alkyldiol having 5-9 carbon atoms. The Examiner relies on Hayashi to provide this missing element. Hayashi teaches an ink composition that is quite different from that of Hirasa, namely an ink that includes *four to five* specific ingredients: “a 1,2-alkanediol, glycerin, a polyhydric alcohol derivative and/or an acetylene glycol surfactant, a water-soluble organic solvent [...]” (see Abstract). Hayashi mentions that addition of a “1,2-alkanediol having 4 to 6 carbon atoms to the ink composition”

(i.e., Hayashi's *inventive* ink composition) "can improve color development and can effectively prevent feathering or bleeding in prints and thus is considered to improve print quality" (see column 3, lines 56-60). Based on this teaching, the Examiner argues that the skilled person would have been motivated to add a 1,2-alkanediol having 4 to 6 carbon atoms to the ink of Hirasa.

To establish a *prima facie* case of obviousness based on a combination of references, three basic criteria must be met. First, the combined references must teach or suggest all of the claimed elements. Second, there must be some suggestion or motivation in the references or in the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings in a way that produces the claimed invention. Finally, there must be a reasonable expectation of success. MPEP § 2142. Here, the Examiner's *prima facie* case fails on at least the second and third criteria.

With respect to the motivation to combine the reference teachings, the Examiner is treating the teachings of Hayashi too broadly. Indeed, as previously noted by Applicant, Hayashi does not teach that addition of 1,2-alkanediol having 4 to 6 carbon atoms to any ink composition "can improve color development and can effectively prevent feathering or bleeding in prints and thus is considered to improve print quality". Instead, Hayashi teaches that addition of this ingredient to his particular ink composition provides these benefits. This difference is subtle but crucial.

Besides, even if the skilled artisan had been motivated to modify Hirasa's ink in this manner, he or she would not have possessed the reasonable expectation of success that is required to make a *prima facie* case of obviousness. Indeed, preparing an ink with a specific combination of properties is notoriously unpredictable. While a particular ingredient may provide certain properties in a first ink it may be unable to provide those properties in a second ink or worse, it may have a detrimental effect on a different property. For this reason, inks with desirable properties are typically created through experimentation in which different combinations and proportions of ingredients are tested through trial and error. To illustrate this, the Examiner is pointed to the Examples of this application and specifically to the Table on page 15. Comparing Ink E with Ink C, the Examiner will see that addition of 1,2-hexanediol improves the drytime considerably (from 7 seconds to 3 seconds). However, this addition also has an adverse impact on the ink's ability to sustain high firing frequencies (dropping from 25 kHz to

20 kHz). Thus, while addition of 1,2-hexanediol improves one property (drytime) it worsens another (firing stability). As illustrated by Ink D, the optimal combination of properties is unexpectedly obtained by keeping a low level of 1,2-hexanediol and increasing the level of the water-soluble polyurethane at the expense of the styrene-acrylic polymer (JONCRYL™ 586). This result could not have been predicted before these experiments were performed.

The same level of unpredictability would have applied to the Examiner's proposed modification of Hirasa based on the teachings of Hayashi. Hirasa teaches an ink that has "excellent keeping quality and jettability characteristics, especially [...] high print density, rubbing resistance, tolerance to marker, water fastness and lightfastness" on a variety of papers (see [0007]). Even if a skilled person would have been motivated to add the 1,2-alkanediol to the ink composition of Hirasa, he or she would have had no idea as to how this change would impact these properties, let alone the reasonable expectation of success that it would maintain them while providing the additional properties of Hayashi that the Examiner argues provide the necessary motivation (i.e., improved color development and prevention of feathering and bleeding). For these reasons, Applicant respectfully submits that the Examiner has failed to make a *prima facie* case of obviousness based on the combination of Hirasa and Hayashi. Withdrawal of this rejection is earnestly requested.<sup>2</sup>

**Rejection under 103(a) based on Hirasa et al. (US 2002/0019458) in view of Hayashi (US 6500248) and Iu et al. (US 6102998)**

The rejection of claims 11-12 under 35 U.S.C. § 103(a) as being unpatentable over Hirasa in view of Hayashi and Iu is hereby traversed, reconsideration is respectfully requested.

As discussed above, the Examiner has failed to establish a *prima facie* case of obviousness with respect to claim 1 based on the combination of Hirasa and Hayashi. Iu is cited as a secondary reference that teaches a co-solvent found in dependent claims 11-12. The Examiner does not point to any teaching in Iu that could remedy the aforementioned deficiencies in the combined teachings of Hirasa and Hayashi. Since the combination of Hirasa and Hayashi

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<sup>2</sup> As an aside, Applicant checked the Examiner's citation to *Miles Lab, Inc. v. Shandon Inc.* 997 F.2d at 878, 27 USPQ 2d 1123, 1128 (Fed. Cir. 1993) but could not find the quotation that the Examiner provided (see page 9 of Office Action).



does not render claim 1 obvious and since Iu does not remedy this failure, claims 11-12 that depend from claim 1 cannot be found obvious in light of any combination of the three references. Withdrawal of this rejection is earnestly requested.

**Rejection under 103(a) based on Hirasa et al. (US 2002/0019458) in view of Hayashi (US 6500248) and Ma et al. (US 5648405)**

The rejection of claims 13-14 under 35 U.S.C. § 103(a) as being unpatentable over Hirasa in view of Hayashi and Ma et al. (US 5648405, hereinafter “Ma”) is hereby traversed, reconsideration is respectfully requested.

As discussed above, the Examiner has failed to establish a *prima facie* case of obviousness with respect to claim 1 based on the combination of Hirasa and Hayashi. Ma is cited as a secondary reference that teaches the desirability of inks with viscosities of less than 10 cps (dependent claims 13-14 require viscosities in the range 1.5 to 6 cps and 2 to 3.4 cps, respectively).<sup>3</sup> The Examiner does not point to any teaching in Ma that could remedy the aforementioned deficiencies in the combined teachings of Hirasa and Hayashi. Since the combination of Hirasa and Hayashi does not render claim 1 obvious and since Ma does not remedy this failure, claims 13-14 that depend from claim 1 cannot be found obvious in light of any combination of the three references. Withdrawal of this rejection is earnestly requested.

**Rejection under 103(a) based on Hirasa et al. (US 2002/0019458) in view of Hayashi (US 6500248) and Elwakil (US 5833743)**

The rejection of claims 15-16 under 35 U.S.C. § 103(a) as being unpatentable over Hirasa in view of Hayashi and Elwakil is hereby traversed, reconsideration is respectfully requested.

As discussed above, the Examiner has failed to establish a *prima facie* case of obviousness with respect to claim 1 based on the combination of Hirasa and Hayashi. Elwakil is cited as a secondary reference that teaches a pH range limitation found in dependent claims 15-16. The Examiner does not point to any teaching in Elwakil that could remedy the

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<sup>3</sup> Applicant respectfully notes that the generic suggestion that inks with viscosities of less than 10 cps exhibit beneficial properties falls far short of teaching the specifically claimed ranges. Applicant also notes that claims 13-14 further require that the ink have a specific surface tension.

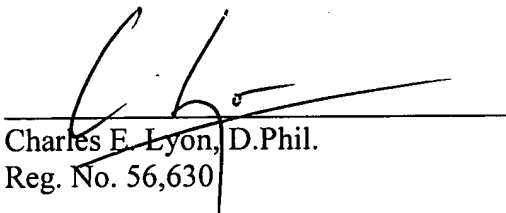
aforementioned deficiencies in the combined teachings of Hirasa and Hayashi. Since the combination of Hirasa and Hayashi does not render claim 1 obvious and since Elwakil does not remedy this failure, claims 15-16 that depend from claim 1 cannot be found obvious in light of any combination of the three references. Withdrawal of this rejection is earnestly requested.

### **Conclusion**

Based on the above, Applicant respectfully requests that the Examiner reconsider and withdraw all outstanding rejections and objections. Favorable consideration and allowance are earnestly solicited. Should there be any questions after reviewing this paper, the Examiner is invited to contact the undersigned at 617-248-4793. It is not believed that extensions of time or fees for net addition of claims are required, beyond those which may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any fees required for consideration of this paper (including fees for net addition of claims) are authorized to be charged in two copies of an Amendment Transmittal Letter filed herewith.

Respectfully submitted,  
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Date: December 4, 2006



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